

Name: _____

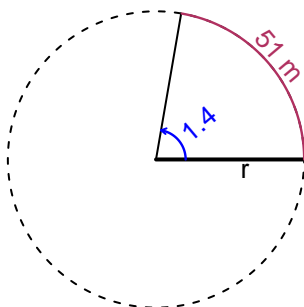
Date: _____

Trig Final (SLTN v653)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 51 meters. The angle measure is 1.4 radians. How long is the radius in meters?

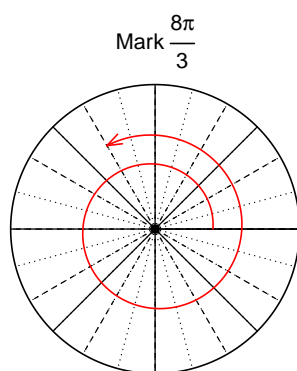


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 36.43$ meters.

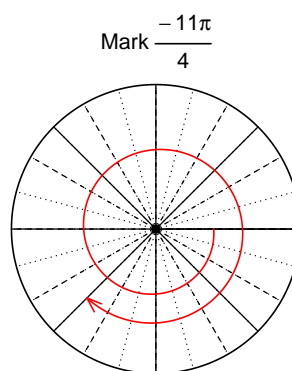
Question 2

Consider angles $\frac{8\pi}{3}$ and $-\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{8\pi}{3}\right)$ and $\cos\left(-\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(8\pi/3)$

$$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$$



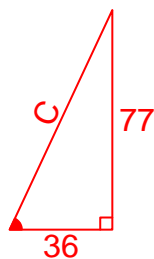
Find $\cos(-11\pi/4)$

$$\cos(-11\pi/4) = -\frac{\sqrt{2}}{2}$$

Question 3

If $\tan(\theta) = \frac{-77}{36}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



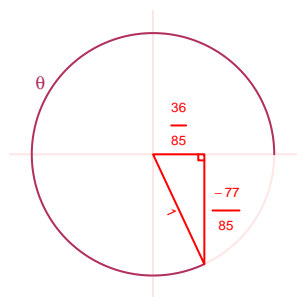
Solve the Pythagorean Equation

$$36^2 + 77^2 = C^2$$

$$C = \sqrt{36^2 + 77^2}$$

$$C = 85$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-77}{85}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 4.3 meters, a midline at $y = 7.37$ meters, and a frequency of 8.39 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.3 \sin(2\pi 8.39t) + 7.37$$

or

$$y = -4.3 \sin(16.78\pi t) + 7.37$$

or

$$y = -4.3 \sin(52.72t) + 7.37$$